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LAKE ERIE SOUTH SHORE TRIBUTARY LOADING DATA SUMMARY, 1967

Federal Water Pollution Control Administration
Chicago, Illinois

August 1968

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1967

UNITED STATES
DEPARTMENT OF INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
GREAT LAKES REGION
CLEVELAND PROGRAM OFFICE

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Summary

The 1967-68 survey determined total solids, chloride, and total phosphorus loadings from thirteen south shore tributaries to Lake Erie. The data show that large quantities of solids and nutrients from basin tributaries are being discharged to Lake Erie. Of the thirteen south shore tributaries sampled, the Maumee River contributes the largest quantities of total solids and total phosphorus. The Grand River (Ohio), because of a large industrial discharge near its mouth, had the largest chloride contribution of the south shore tributaries. It is apparent from the limited sampling program that the largest tributary loading occurs during high flow.

INTRODUCTION

The following report presents load data for thirteen south shore tributaries discharging to Lake Erie. The report is the first of an anticipated annual series to be prepared by the Cleveland Program Office of the Federal Water Pollution Control Administration, Great Lakes Region. All significant data gathered in biweekly sampling as well as available downstream industrial and municipal outfall data will be included. Loadings from downstream surcharged storm and sanitary sewers are not included.

The purpose of the reports is to better determine tributary loadings to Lake Erie and to chronicle changes in loadings as pollution abatement measures are activated. It is not the intent to provide detailed interpretive evaluations, although the data may prove valuable in water quality standards compliance assessment.

All water quality data of a routine nature are to be entered into the STORET data processing system in use by the Federal Water Pollution Control Administration.

ACKNOWLEDGMENT

The cooperation of the United States Department of the Interior, Geological Survey, Water Resources Division is gratefully acknowledged for providing streamflow data.

PROGRAM

The Federal Water Pollution Control Administration surveillance program on Lake Erie was initiated in response to a recommendation by the state-federal Conference on Pollution in Lake Erie and its Tributaries in August 1965. A biweekly sampling program on thirteen south shore tributaries to Lake Erie was established as part of this surveillance program to monitor tributary loadings to Lake Erie.

Sampling locations (Figure 1) were located in non-lake affected areas with samples collected in mid-stream at mid-depth and identified by mileage above the tributary mouth (Table 1). Total tributary loadings are obtained by combining loadings at the sampling locations with downstream outfall loadings.

The sampling program has been accomplished to date as planned except for some winter sampling not performed due to extensive ice coverage. The reported data cover a one-year period beginning February 15, 1967. The program is to continue indefinitely.

PARAMETERS

The water quality parameters shown are those which have been

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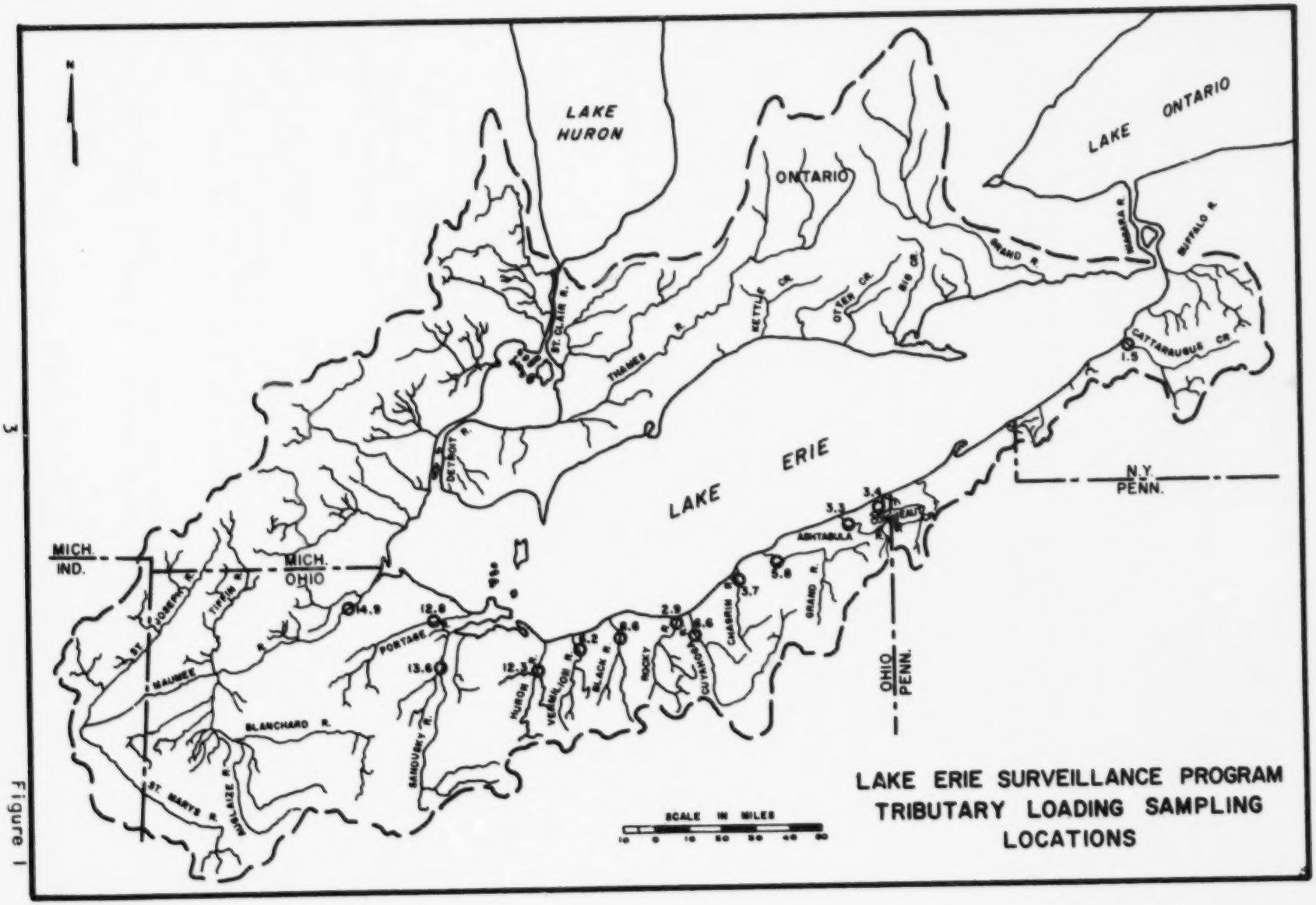

LAKE ERIE SURVEILLANCE PROGRAM
TRIBUTARY LOADING SAMPLING
LOCATIONS

Figure 1

considered up to this time as most significant in Lake Erie. These include total solids, chlorides, and total phosphorus. To date, sufficient data have not been available to adequately determine loadings of these substances to Lake Erie.

METHODS

The analytical and field methods used by the Cleveland Program Office are given in the "Laboratory Manual, Cleveland Program Office", available from that office of the Federal Water Pollution Control Administration.

Momentary flow data were obtained from the nearest U. S. Department of the Interior, Geological Survey gaging stations and prorated to the sampling locations on the basis of drainage area. Momentary loadings at the sampling locations (Table 2) were calculated using the momentary flow and the parameter concentration.

Average daily tributary loadings at sampling locations (Table 4) were calculated by dividing the sum of the momentary loadings by the sum of the momentary flows and multiplying by the average flow for the period of record at the nearest gaging station.

Tributary loadings to Lake Erie (Table 6) have been obtained by summing the loading at the sampling location and all known major downstream loadings from outfalls (Table 5).

DISCUSSION OF ANALYTICAL DATA

The data obtained in the 1967-68 survey provided a limited basis for the determination of tributary loadings to Lake Erie. The reader is cautioned to note that all loadings are subject to revision with the accumulation of additional sampling, outfall and overflow data.

Widely variable flow conditions were encountered at the times of sampling (Table 2). Generally, concentrations did not show consistent changes with changes in flow, however major loadings did occur during high discharges. The highest single concentration of total solids and chloride was noted in the Grand River (Table 3). The highest phosphorus concentration noted was in the Cuyahoga River.

The summary tabulation of tributary loadings at the sampling locations (Table 4) shows the Maumee River, with the greatest flow of the tributaries sampled, as having the largest loading contribution. The Ashtabula River, with the smallest flow, has the smallest contribution of total solids and chlorides. Total phosphorus loading was least in Conneaut Creek.

Since the sampling locations are several miles above the mouth of the tributaries, downstream sources must be considered in determining

total loadings. Major known downstream sources in each of the tributaries have been listed (Table 5). Municipal loadings were estimated and industrial loadings were calculated from available data. In the Grand and Ashtabula Rivers downstream inputs far exceeded the loadings at the sampling locations. However, in the other tributaries, downstream inputs were less significant.

Tabulation of tributary loadings to Lake Erie (sampling location plus downstream data, Table 6) shows the Maumee River as contributing the largest amount of total solids and total phosphorus. The Grand River, because of a large industrial discharge near its mouth, is the largest contributor of chlorides. The smallest contribution of total solids was noted in Conneaut Creek. The smallest chloride loading was in the Huron River and the smallest phosphorus loading was in the Ashtabula River.

Several factors should be considered when evaluating the adequacy of the data presented. The limited frequency of sample collection, particularly during periods of high flow, could bias the data. Sedimentation of the constituents through chemical, biological, and physical means, could result in low tributary loading values. The loadings determined from the sampling program do not include bed load. During high flows, bed load transport to the lake is probably high. Downstream industrial and municipal outfall data are not complete, but will be updated as information becomes available. Contributions from untold numbers of combined sewer and storm water overflows existing in the lower reaches of many tributaries also may be significant but are not included in the data. The loading data presented is thus very conservative.

LIST OF ABBREVIATIONS FOR DATA COMPILATION

Abbreviations used in this report for tabulated data are as follows:

Units

- mg/l - milligrams per liter
- #/sec - pounds per second
- #/day - pounds per day
- CFS - cubic feet per second
- mgd - million gallons per day
- °C - degrees centigrade

Water Chemistry

- S - suspended solids
- BOD - biochemical oxygen demand in mg/l

General abbreviations

- x - insufficient data
- P.E. - population equivalent

TABLE I

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY SAMPLING LOCATIONS

Mile Point	Tributary	Description
14.9	Maumee River	Route 20 bridge near Maumee, Ohio
12.8	Portage River	Route 19 bridge south of Oak Harbor, Ohio
13.6	Sandusky River	Route 20 bridge north of Fremont, Ohio
12.3	Huron River	Route 250 & 13 bridge NW of Milan, Ohio
6.2	Vermilion River	North Ridge Road Bridge west of Brownhelm, Ohio
8.6	Black River	Route 254 bridge (Detroit Road) north of Elyria
2.9	Rocky River	Rocky River Reservation Road ford near Wooster Road and Rockcliff Drive
6.6	Cuyahoga River	RR Bridge, north of Harvard-Denison Bridge at end of Denison Road
3.7	Chagrin River	County Road Bridge between south end of Lost Nation Road and Erie Road, northeast of Willoughby, Ohio
5.8	Grand River	Route 20 Bridge, northeast of Painesville, Ohio. One mile northeast of Route 86
3.3	Ashtabula River	Main Ave. Bridge, 0.1 miles north of Route 20 in Ashtabula, Ohio
3.4	Conneaut Creek	Mill Road Bridge adjacent to Route 7 bridge, southwest of Conneaut, Ohio
1.5	Cattaraugus Creek	Buffalo Road Bridge, 0.4 miles north of Routes 20-5, north of Irving, New York

TABLE 2

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Maumee River — Mile Point: 14.9

Date	Temp. °C	CFS Momentary	Total Solids mg/l	Total Solids #/sec.	Chlorides mg/l	Chlorides #/sec.	Total Phosphorus mg/l	Total Phosphorus #/sec.
2-15-67	1.0	3,730	481	113.0	27	6.35	0.14	0.033
3-15-67	4.0	23,370	498	733.1	14	20.61	0.33	0.486
4-18-67	12.5	7,121	506	227.2	22	9.88	0.93	0.418
5-3-67	6.5	2,146	450	60.8	20	2.70	0.75	0.101
5-17-67	11.5	7,051	431	191.4	13	5.77	0.47	0.209
6-1-67	16.0	2,417	402	61.1	22	3.34	0.32	0.049
6-7-67	21.0	1,123	378	26.8	23	1.63	0.21	0.015
6-20-67	21.5	1,063	476	31.9	28	1.88	0.28	0.019
7-5-67	20.0	828	508	26.4	33	1.72	0.40	0.021
7-20-67	21.0	477	499	15.0	40	1.20	0.15	0.005
8-2-67	23.0	2,377	520	78.0	24	3.60	0.61	0.092
8-17-67	23.5	196	474	5.7	42	0.50	0.31	0.004
8-29-67	20.0	196	522	6.3	49	0.59	0.34	0.004
9-13-67	19.0	208	453	5.9	50	0.65	0.21	0.003
9-26-67	15.0	355	446	9.8	40	0.88	0.30	0.007
10-9-67	13.0	321	467	9.3	48	0.96	0.37	0.007
10-26-67	7.5	592	553	20.5	55	2.04	0.80	0.030
11-8-67	4.5	3,059	495	95.5	38	7.33	0.55	0.106
11-20-67	3.5	3,059	481	92.8	31	5.98	0.37	0.071
12-7-67	4.0	20,260	524	668.6	20	25.52	0.45	0.574
12-19-67	3.5	12,036	408	309.3	17	12.89	0.29	0.220
1-29-68	1.5	No Record	582	--	50	--	0.66	--

TABLE 2 (Continued)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Portage River — Mile Point: 12.8

Date	Temp. °C	CFS Momentary	Total Solids mg/l	Total Solids #/sec.	Chlorides mg/l	Chlorides #/sec.	Total Phosphorus mg/l	Total Phosphorus #/sec.
2-15-67	0	610	535	20.3	42	1.60	0.22	0.0084
3-15-67	4.0	1,395	455	40.0	23	2.02	0.17	0.0150
4-18-67	14.0	308	572	10.9	33	0.63	0.65	0.0124
5-3-67	8.0	365	592	13.6	37	0.85	0.93	0.0214
5-17-67	12.0	383	552	13.2	24	0.58	0.22	0.0053
6-1-67	18.0	78	488	2.4	43	0.22	0.40	0.0020
6-7-67	21.5	39	453	0.9	53	0.11	0.42	0.0008
6-20-67	23.0	35	635	0.7	71	0.14	0.44	0.0009
7-5-67	21.5	34	673	0.7	78	0.16	0.54	0.0011
7-20-67	21.0	270	561	9.5	70	1.19	0.29	0.0049
8-2-67	23.5	446	564	12.5	16	0.45	0.52	0.0146
8-17-67	22.0	11	481	0.5	39	0.04	0.47	0.0005
8-29-67	20.5	33	664	1.3	55	0.13	0.35	0.0007
9-13-67	19.0	10	681	0.7	87	0.09	0.36	0.0004
9-26-67	15.0	28	783	1.6	115	0.23	0.72	0.0014
10-9-67	14.5	23	531	0.5	45	0.05	0.44	0.0004
10-26-67	8.5	35	551	1.1	41	0.08	0.43	0.0009
11-8-67	2.5	226	530	7.4	30	0.42	0.28	0.0039
11-20-67	2.0	344	553	12.2	43	0.95	0.52	0.0114
12-7-67	5.0	1,596	562	56.8	26	2.63	0.25	0.0253
12-19-67	4.0	544	217	7.4	34	1.16	0.22	0.0075
1-5-68	0	No Record	640	--	45	--	0.34	--
1-17-68	0	111	707	4.9	57	0.40	0.65	0.0046
1-29-68	1.0	4,990	489	153.5	27	8.48	0.84	0.2638

TABLE 2 (Continued)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Sandusky River — Mile Point: 13.6

Date	Temp. °C	CFS Momentary	Total Solids		Chlorides		Total Phosphorus	
			mg/l	#/sec.	mg/l	#/sec.	mg/l	#/sec.
2-15-67	1.0	1,160	564	41.2	27	1.97	0.16	0.0117
3-15-67	4.0	4,206	406	107.6	15	3.98	0.27	0.0716
4-18-67	14.0	829	485	25.2	25	1.30	0.64	0.0333
5-3-67	8.0	2,831	505	89.9	20	3.56	0.53	0.0943
5-17-67	12.0	2,042	472	60.9	13	1.67	0.23	0.0297
6-1-67	18.0	386	403	9.7	28	0.67	0.33	0.0079
6-7-67	22.0	215	425	6.0	26	0.36	0.44	0.0062
6-20-67	21.5	558	522	18.3	31	1.09	0.36	0.0126
7-5-67	21.5	289	492	8.9	24	0.43	0.42	0.0076
7-20-67	21.5	134	486	3.9	19	0.15	0.52	0.0052
8-2-67	24.5	323	508	10.2	22	0.44	0.45	0.0090
8-17-67	22.0	50	446	1.3	30	0.13	0.58	0.0017
8-29-67	20.5	63	499	2.0	37	0.15	0.86	0.0034
9-13-67	19.0	47	569	1.7	44	0.13	0.85	0.0026
9-26-67	17.0	65	608	2.4	45	0.18	0.78	0.0031
10-9-67	15.0	1,031	673	43.7	41	2.67	0.45	0.0293
10-26-67	--	934	619	36.5	31	1.83	0.49	0.0289
11-8-67	2.5	558	465	16.3	26	0.91	0.90	0.0315
11-20-67	2.0	549	555	18.9	30	1.02	0.29	0.0099
12-7-67	4.0	4,368	435	119.6	19	5.23	0.33	0.0908
12-19-67	4.5	882	494	27.7	22	1.23	0.24	0.0134
1-5-68	0	No Record	581	--	41	--	0.23	--
1-17-68	0	No Record	791	--	68	--	0.36	--
1-29-68	0.5	8,836	996	554.8	24	13.37	1.14	0.6350

TABLE 2 (Continued)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Huron River — Mile Point: 12.3

Date	Temp. °C	CFS Momentary	Total Solids		Chlorides		Total Phosphorus	
			mg/l	#/sec.	mg/l	#/sec.	mg/l	#/sec.
2-15-67	2.0	650	499	20.5	20	0.82	0.16	0.0066
3-15-67	4.0	588	395	14.6	19	0.70	0.12	0.0044
4-18-67	12.5	220	454	6.4	21	0.29	0.48	0.0067
5-3-67	6.0	1,760	455	50.5	12	1.33	0.68	0.0755
5-17-67	12.0	455	466	13.5	18	0.52	0.24	0.0070
6-1-67	16.0	98	495	3.0	22	0.13	0.50	0.0030
6-7-67	21.0	74	466	2.3	26	0.13	0.54	0.0027
6-20-67	20.0	65	569	2.3	27	0.11	0.43	0.0017
7-5-67	18.0	41	389	1.2	18	0.05	0.33	0.0010
7-20-67	16.0	811	997	50.8	13	0.66	0.31	0.0158
8-2-67	23.0	26	533	1.1	27	0.05	0.61	0.0012
8-17-67	21.5	15	573	0.6	45	0.05	1.46	0.0015
8-29-67	15.5	18	471	0.5	32	0.03	1.25	0.0013
9-13-67	15.0	11	517	0.5	39	0.04	1.58	0.0016
9-26-67	12.0	18	563	0.6	30	0.03	1.24	0.0012
10-9-67	--	20	610	0.6	100	0.10	2.04	0.0020
10-26-67	6.5	22	505	0.5	33	0.03	0.80	0.0008
11-8-67	1.0	81	511	2.6	31	0.16	0.32	0.0016
11-20-67	1.9	120	504	4.0	28	0.22	0.19	0.0015
12-7-67	5.0	697	427	18.8	24	1.06	0.14	0.0062
12-19-67	3.5	240	523	7.8	24	0.36	0.21	0.0032
1-5-68	0	209	650	8.5	33	0.43	0.28	0.0036
1-29-68	0.5	650	539	22.1	15	0.62	0.37	0.0152

TABLE 2 (Continued)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Vermilion River — Mile Point: 6.2

Date	Temp. °C	CFS Momentary	Total Solids mg/l	Total Solids #/sec.	Chlorides mg/l	Chlorides #/sec.	Total Phosphorus mg/l	Total Phosphorus #/sec.
2-15-67	1.0	1,200	489	37.16	21	1.600	0.09	0.00684
3-1-67	0	50	471	1.41	34	0.102	0.03	0.00009
3-15-67	4.0	460	330	9.57	17	0.493	0.07	0.00203
4-18-67	--	170	336	3.70	19	0.209	0.15	0.00165
5-3-67	7.0	1,430	369	33.21	12	1.080	0.53	0.04770
5-17-67	12.0	450	361	10.11	13	0.364	0.09	0.00252
6-1-67	18.0	44	317	0.95	21	0.063	0.05	0.00015
6-7-67	20.5	22	356	0.36	24	0.024	0.04	0.00004
6-20-67	20.0	14	424	0.42	32	0.032	0	0
7-5-67	17.0	29	353	0.70	15	0.030	0.08	0.00016
7-20-67	18.5	24	355	0.71	29	0.058	0.04	0.00008
8-2-67	26.0	8	358	0.18	25	0.013	0.04	0.00002
8-17-67	21.0	2	282	0.03	22	0.003	0.03	0.00001
8-29-67	15.5	3	311	0.59	23	0.043	0.04	0.00008
9-13-67	14.0	1	348	0.02	33	0.002	0.04	0.00001
9-26-67	17.0	11	354	2.45	37	0.256	0.06	0.00042
10-9-67	13.0	9	413	0.24	32	0.018	0.07	0.00004
10-26-67	6.5	16	442	0.45	45	0.045	0.07	0.00007
11-8-67	2.0	53	435	1.31	34	0.102	0.07	0.00021
11-20-67	2.0	172	476	5.24	35	0.385	0.05	0.00055
12-7-67	4.5	730	400	18.40	22	1.012	0.13	0.00598
12-19-67	4.5	105	455	3.19	26	0.182	0.06	0.00042
1-5-68	0	170	534	5.87	35	0.385	0.07	0.00077
1-29-68	0.5	4,000	654	166.12	32	8.128	0.41	0.10414

TABLE 2 (Continued)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Black River — Mile Point: 8.6

Date	Temp. °C	CFS Momentary	Total Solids mg/l	Total Solids #/sec.	Chlorides mg/l	Chlorides #/sec.	Total Phosphorus mg/l	Total Phosphorus #/sec.
2-15-67	2.0	920	533	30.91	47	2.726	0.33	0.0191
3-1-67	--	68	677	2.91	130	0.559	0.44	0.0019
3-15-67	5.0	550	368	12.88	32	1.120	0.19	0.0067
4-19-67	10.5	151	418	4.18	39	0.390	1.33	0.0133
5-3-67	8.0	1,088	489	33.74	33	2.277	0.13	0.0090
5-17-67	13.0	516	466	15.38	32	1.056	0.52	0.0172
6-2-67	16.0	46	484	1.40	59	0.171	1.85	0.0054
6-7-67	21.0	33	553	1.16	95	0.199	2.00	0.0042
6-19-67	21.0	23	560	0.78	106	0.148	2.08	0.0029
7-5-67	16.5	23	507	0.71	85	0.119	1.53	0.0021
7-20-67	21.0	17	499	0.55	98	0.108	2.96	0.0033
8-3-67	23.0	8	562	0.28	96	0.048	3.88	0.0019
8-15-67	19.0	7	549	0.24	113	0.050	5.98	0.0026
8-29-67	19.0	12	649	0.49	118	0.090	4.36	0.0033
9-13-67	15.0	7	682	0.30	124	0.055	5.14	0.0023
9-26-67	15.0	7	638	0.28	106	0.047	5.25	0.0023
10-9-67	15.0	11	667	0.46	76	0.052	3.88	0.0027
10-26-67	10.0	27	712	1.21	109	0.185	2.87	0.0049
11-8-67	6.0	25	561	0.89	82	0.130	2.25	0.0036
11-20-67	4.5	25	636	1.00	121	0.191	1.83	0.0029
12-7-67	6.0	142	767	6.83	125	1.112	1.08	0.0096
12-20-67	4.0	66	655	2.75	87	0.365	0.91	0.0038
1-2-68	0	45	548	1.53	73	0.204	1.69	0.0047
1-30-68	0	6,825	495	212.85	36	15.480	0.68	0.2924

TABLE 2 (Continued)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Rocky River — Mile Point: 2.9

Date	Temp. °C	CFS Momentary	Total Solids		Chlorides		Total Phosphorus	
			mg/l	#/sec.	mg/l	#/sec.	mg/l	#/sec.
2-15-67	3.0	1,220	474	36.5	72	5.544	0.29	0.0223
3-1-67	0	134	729	6.1	185	1.554	0.61	0.0051
3-15-67	4.5	327	419	8.8	54	1.134	0.42	0.0088
4-19-67	9.0	126	418	3.8	53	0.419	1.52	0.0120
5-4-67	2.0	327	392	8.1	43	0.886	1.15	0.0237
5-18-67	11.0	255	413	6.6	32	0.515	0.42	0.0068
6-2-67	16.0	41	510	1.3	110	0.284	1.38	0.0036
6-8-67	21.0	28	559	1.0	75	0.132	2.52	0.0044
6-19-67	17.0	22	554	0.8	92	0.127	3.32	0.0046
7-6-67	18.0	14	535	0.5	84	0.074	5.53	0.0049
7-20-67	21.0	45	513	1.5	93	0.264	3.38	0.0096
8-3-67	24.0	11	657	0.5	168	0.116	3.16	0.0022
8-15-67	20.0	8	520	0.3	103	0.056	3.67	0.0020
8-30-67	19.5	12	575	0.4	118	0.090	5.53	0.0042
9-14-67	21.0	6	528	0.2	110	0.042	4.65	0.0018
9-27-67	17.0	10	524	0.3	103	0.065	3.85	0.0024
10-9-67	17.0	27	532	0.9	84	0.143	3.26	0.0055
10-26-67	6.0	23	483	0.7	89	0.129	2.89	0.0042
11-8-67	4.0	23	591	0.9	107	0.155	2.67	0.0039
11-20-67	2.5	No Record	582	--	109	--	1.17	--
12-7-67	4.5	181	561	6.4	82	0.935	1.08	0.0123
12-20-67	3.0	157	568	5.6	79	0.781	1.14	0.0113
1-2-68	0	167	646	6.8	119	1.252	1.21	0.0127
1-16-68	0	No Record	743	--	177	--	2.28	--
1-30-68	0.5	7,405	769	359.1	42	19.614	0.52	0.2428

TABLE 2 (Continued)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Cuyahoga River — Mile Point: 6.6

Date	Temp. °C	CFS[1] Momentary	Total Solids mg/l	Total Solids #/sec.	Chlorides mg/l	Chlorides #/sec.	Total Phosphorus mg/l	Total Phosphorus #/sec.
2-15-67	5.0	1,440	785	71.4	142	12.92	1.27	0.116
3-1-67	1.0	559	1,062	37.2	274	1.00	0.39	0.014
3-15-67	7.0	2,320	605	88.3	100	14.60	0.75	0.110
4-19-67	11.0	754	588	28.2	98	4.70	2.77	0.133
5-4-67	8.0	1,321	544	45.2	79	6.56	2.40	0.199
5-18-67	13.0	2,110	548	72.3	78	10.30	1.47	0.194
6-2-67	--	409	693	18.0	133	3.46	1.43	0.037
6-8-67	21.5	346	909	20.0	137	3.01	2.83	0.062
6-19-67	22.0	281	1,247	22.4	179	3.22	6.43	0.116
7-6-67	19.0	293	778	14.0	161	2.90	2.47	0.044
7-20-67	22.0	351	720	15.8	154	3.39	2.65	0.058
8-3-67	24.0	616	784	30.6	181	7.06	2.80	0.109
8-15-67	22.0	253	977	15.6	187	2.99	4.03	0.064
8-30-67	21.0	320	921	18.4	173	3.46	2.24	0.045
9-14-67	20.0	259	1,001	16.0	196	3.14	2.21	0.035
9-27-67	19.0	278	864	15.6	157	2.83	1.99	0.036
10-9-67	17.0	474	771	23.1	122	3.66	1.60	0.048
10-26-67	13.0	345	846	18.6	150	3.30	2.77	0.061
11-8-67	9.0	398	857	21.4	146	3.65	2.77	0.069
11-20-67	5.5	887	619	34.7	115	6.44	1.50	0.084
12-7-67	8.0	915	693	40.2	99	5.74	1.79	0.104
12-20-67	6.0	720	602	27.1	78	3.51	2.11	0.095
1-2-68	2.0	430	776	21.0	163	4.40	2.93	0.079
1-16-68	2.5	247	977	15.6	232	3.71	2.58	0.041
1-30-68	2.0	8,901	998	559.9	71	39.83	1.73	0.971

[1] Momentary flow includes 120 cfs from Southerly Sewage Treatment Plant

TABLE 2 (Continued)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Chagrin River — Mile Point: 3.7

Date	Temp. °C	CFS Momentary	Total Solids		Chlorides		Total Phosphorus	
			mg/l	#/sec.	mg/l	#/sec.	mg/l	#/sec.
2-15-67	0	981	415	25.7	62	3.84	0.17	0.0105
3-2-67	1.0	103	412	2.5	59	0.35	0.10	0.0006
3-15-67	--	401	252	6.3	28	0.70	0.07	0.0018
4-18-67	11.5	166	296	3.0	37	0.37	0.31	0.0031
5-2-67	9.0	273	308	5.2	28	0.48	0.26	0.0044
5-15-67	--	487	306	9.5	21	0.65	0.09	0.0028
6-2-67	17.0	85	300	1.5	27	0.14	0.20	0.0010
6-7-67	23.0	60	279	1.1	28	0.11	0.11	0.0004
6-19-67	21.0	65	278	1.1	26	0.10	0.07	0.0003
7-5-67	19.0	65	413	1.7	30	0.12	0.20	0.0004
7-19-67	18.0	87	349	1.7	22	0.11	0.20	0.0010
8-2-67	22.0	32	312	0.6	28	0.05	0.13	0.0003
8-15-67	22.5	30	343	0.7	36	0.07	0.10	0.0002
8-30-67	20.0	44	350	1.1	30	0.09	0.08	0.0002
9-12-67	18.5	40	325	1.0	34	0.10	0.10	0.0003
9-25-67	12.0	44	351	1.1	33	0.10	0.16	0.0005
10-10-67	12.5	103	375	2.3	35	0.21	0.16	0.0010
10-26-67	6.0	66	289	1.2	31	0.12	0.07	0.0003
11-8-67	3.0	190	312	3.7	33	0.40	0.13	0.0016
11-20-67	3.0	838	327	17.3	28	1.48	0.19	0.0101
12-7-67	5.0	466	292	8.5	30	0.87	0.10	0.0029
12-20-67	2.0	253	296	4.7	28	0.45	0.15	0.0024
1-2-68	0	299	345	6.6	45	0.86	0.11	0.0021
1-29-68	1.0	4,203	1,732	459.0	36	9.54	0.88	0.2332

TABLE 2 (Continued)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Grand River — Mile Point: 5.8

Date	Temp. °C	CFS Momentary	Total Solids mg/l	Total Solids #/sec.	Chlorides mg/l	Chlorides #/sec.	Total Phosphorus mg/l	Total Phosphorus #/sec.
2-15-67	0	710	260	11.7	30	1.35	0.08	0.00360
3-2-67	1.0	1,633	273	28.1	29	2.99	0.10	0.01030
3-15-67	3.5	2,425	171	26.2	15	2.30	0.06	0.00918
4-18-67	15.0	308	4,990	94.8	2,294	43.59	0.17	0.00323
5-2-67	10.5	1,041	3,051	201.4	56	3.70	0.42	0.02772
5-15-67	--	3,312	220	46.0	8	1.67	0.18	0.03762
5-31-67	18.5	85	177	0.9	19	0.10	0.07	0.00035
6-7-67	23.5	43	177	0.5	22	0.07	0.03	0.00001
6-20-67	24.0	22	277	0.3	27	0.03	0.01	0.00001
7-5-67	20.0	40	325	1.0	31	0.09	0.06	0.00027
7-19-67	20.5	62	197	0.8	23	0.09	0.05	0.00020
8-2-67	22.0	69	218	0.9	17	0.07	0.05	0.00020
8-16-67	20.0	28	240	0.5	26	0.05	0.04	0.00004
8-29-67	22.0	38	260	0.5	35	0.07	0.05	0.00010
9-12-67	17.0	15	282	0.3	51	0.06	0.04	0.00001
9-25-67	13.0	24	276	0.6	35	0.07	0.11	0.00022
10-9-67	14.0	67	229	0.9	25	0.10	0.05	0.00020
10-26-67	9.0	189	192	2.3	17	0.20	0.05	0.00060
11-7-67	2.5	1,034	198	12.9	23	1.50	0.07	0.00455
11-20-67	2.0	4,531	192	54.7	17	4.85	0.08	0.02280
12-7-67	3.5	2,875	194	35.1	18	3.26	0.04	0.00724
12-19-67	4.0	807	234	11.9	18	0.92	0.07	0.00357
1-2-68	0.5	1,479	216	20.1	26	2.42	0.07	0.00651
1-16-68	0	1,183	281	21.1	46	3.45	0.07	0.00525
1-29-68	0	875	313	17.2	28	1.54	0.16	0.00880

TABLE 2 (Continued)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Ashtabula River — Mile Point: 3.3

Date	Temp. °C	CFS Momentary	Total Solids		Chlorides		Total Phosphorus	
			mg/l	#/sec.	mg/l	#/sec.	mg/l	#/sec.
2-15-67	0	405	243	6.32	38	0.988	0.05	0.00130
3-1-67	0	45	403	1.21	100	0.300	0.05	0.00015
3-15-67	4.0	176	160	0.18	20	0.022	0.02	0.00002
4-18-67	10.0	74	219	1.03	35	0.165	0.15	0.00071
5-2-67	9.0	69	237	1.02	31	0.133	0.11	0.00047
5-15-67	--	137	215	1.85	16	0.138	0.16	0.00138
5-31-67	15.5	8	242	0.12	31	0.016	0.21	0.00011
6-7-67	21.0	3	237	0.04	41	0.008	0.03	0.00001
6-20-67	21.0	1	381	0.04	54	0.005	0.17	0.00002
7-5-67	--	10	330	0.20	39	0.023	0.07	0.00004
7-19-67	18.0	26	226	0.36	31	0.050	0.06	0.00010
8-2-67	19.5	21	211	0.27	21	0.027	0.03	0.00004
8-16-67	20.0	15	261	0.23	31	0.028	0.03	0.00003
8-29-67	19.0	45	203	0.57	26	0.073	0.04	0.00011
9-12-67	14.0	19	230	0.28	38	0.046	0.04	0.00005
9-25-67	10.0	10	299	0.18	37	0.022	0.05	0.00003
10-9-67	13.5	80	205	1.02	23	0.115	0.07	0.00035
10-26-67	--	57	146	0.53	20	0.072	0.04	0.00014
11-7-67	1.0	431	175	4.73	21	0.567	0.05	0.00135
11-20-67	1.0	610	121	4.60	14	0.532	0.05	0.00190
12-8-67	4.5	431	158	4.27	17	0.459	0.02	0.00054
12-19-67	4.0	367	207	4.76	22	0.506	0.05	0.00115
1-5-68	0	86	202	1.01	28	0.140	0.03	0.00015
1-29-68	1.0	1,227	486	37.42	29	2.233	0.20	0.01540

TABLE 2 (Continued)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Conneaut Creek — Mile Point: 3.4

Date	Temp. °C	CFS Momentary	Total Solids mg/l	Total Solids #/sec.	Chlorides mg/l	Chlorides #/sec.	Total Phosphorus mg/l	Total Phosphorus #/sec.
2-15-67	0	825	222	11.5	33	1.716	0.02	0.00104
3-1-67	0	72	253	1.1	32	0.144	0.07	0.00032
3-15-67	3.9	304	154	3.0	19	0.365	0.03	0.00058
4-18-67	11.0	304	209	4.0	34	0.653	0.26	0.00499
5-2-67	10.0	112	224	1.6	27	0.192	0.11	0.00078
5-15-67	--	279	204	3.6	16	0.282	0.09	0.00158
5-31-67	16.0	52	200	0.7	31	0.102	0.06	0.00020
6-7-67	21.5	36	180	0.4	30	0.069	0.10	0.00023
6-20-67	24.0	20	302	0.4	58	0.075	0.02	0.00003
7-5-67	18.0	32	249	0.5	35	0.070	0.07	0.00014
7-19-67	19.0	85	203	1.1	35	0.189	0.06	0.00032
8-2-67	20.5	66	161	0.7	22	0.092	0.03	0.00013
8-16-67	20.0	41	238	0.6	46	0.120	0.01	0.00003
8-29-67	18.5	70	243	1.1	34	0.150	0.01	0.00004
9-12-67	15.0	64	223	0.9	33	0.132	0.02	0.00008
9-25-67	11.0	34	270	0.6	40	0.084	0.01	0.00002
10-9-67	14.0	150	192	1.8	24	0.228	0.05	0.00048
10-26-67	8.0	126	173	1.4	23	0.182	0.04	0.00032
11-7-67	2.0	496	175	5.5	28	0.874	0.04	0.00125
11-20-67	1.5	1,343	130	11.0	13	1.100	0.04	0.00338
12-8-67	4.0	866	163	8.9	16	0.874	0.04	0.00218
12-19-67	5.0	457	218	6.3	21	0.605	0.08	0.00230
1-5-68	0	391	207	5.1	26	0.640	0.02	0.00049
1-17-68	0.5	336	213	4.5	41	0.869	0.03	0.00064
1-29-68	1.0	5,888	204	75.7	29	10.756	0.04	0.01483

TABLE 2 (Concluded)

LAKE ERIE ROUTINE SURVEILLANCE
TRIBUTARY WATER CHEMISTRY AND MOMENTARY LOADINGS
AT SAMPLING LOCATIONS

Tributary: Cattaraugus Creek — Mile Point: 1.5'

Date	Temp. °C	CFS Momentary	Total Solids mg/l	Total Solids #/sec.	Chlorides mg/l	Chlorides #/sec.	Total Phosphorus mg/l	Total Phosphorus #/sec.
2-15-67	0	686	254	11.0	17	0.734	0.01	0.00004
3-1-67	0	466	516	15.2	25	0.735	0.14	0.00412
3-15-67	3.5	2,410	292	44.3	8	1.214	0.11	0.01670
4-18-67	9.0	3,227	728	148.0	10	2,033	0.10	0.00203
5-2-67	9.0	557	271	9.5	13	0.456	0.12	0.00421
5-15-67	--	1,140	258	18.5	7	0.503	0.05	0.00359
5-31-67	13.0	412	187	4.9	10	0.260	0.14	0.00364
6-7-67	19.0	298	222	4.2	25	0.470	0.13	0.00244
6-20-67	20.0	228	288	4.1	31	0.446	0.06	0.00064
7-5-67	17.5	286	298	5.4	21	0.378	0.49	0.00882
7-19-67	21.0	175	237	2.6	24	0.264	0.05	0.00055
8-2-67	21.5	157	372	3.7	42	0.416	0.05	0.00050
8-16-67	21.0	145	408	3.7	30	0.273	0.05	0.00046
8-29-67	17.5	302	332	6.3	24	0.456	0.06	0.00114
9-12-67	14.0	207	359	4.7	52	0.676	0.03	0.00039
9-25-67	11.0	290	314	5.7	15	0.275	0.07	0.00128
10-9-67	13.5	499	305	9.6	18	0.565	0.05	0.00157
10-26-67	8.5	2,618	855	141.0	10	1.649	0.36	0.05936
11-7-67	2.0	800	227	11.4	13	0.655	0.06	0.00302
11-20-67	0.5	1,957	248	30.6	11	1.356	0.07	0.00863
12-8-67	4.0	3,629	736	168.2	8	1.829	0.27	0.06172
12-19-67	5.0	2,462	472	73.2	8	1.241	0.21	0.03257
1-5-68	0	700	263	11.6	17	0.750	0.07	0.00309
1-29-68	1.0	845	226	12.0	12	0.638	0.07	0.00372

TABLE 3

SUMMARY OF TRIBUTARY WATER CHEMISTRY
AT SAMPLING LOCATIONS

Sampling Location	CFS[1]	Total Solids, mg/l			Chlorides, mg/l			Total Phosphorus, mg/l		
		Max.	Min.	Avg.[2]	Max.	Min.	Avg.[2]	Max.	Min.	Avg.[2]
14.9 Maumee River	4,610	582	378	480	55	14	32	0.93	0.14	0.42
12.8 Portage River	294	783	217	561	115	16	47	0.93	0.17	0.44
13.6 Sandusky River	900	996	403	542	68	13	30	1.14	0.16	0.49
12.3 Huron River	267	997	389	527	100	12	29	2.04	0.12	0.62
6.2 Vermilion River	217	654	282	401	45	12	27	0.53	0	0.10
8.6 Black River	302	767	368	570	130	32	84	5.98	0.13	2.22
2.9 Rocky River	250	769	392	552	185	32	95	5.53	0.29	2.30
6.6 Cuyahoga River	862	1,247	544	807	274	71	144	6.43	0.39	2.32
3.7 Chagrin River	313	1,752	252	366	62	21	32	0.88	0.07	0.17
5.8 Grand River	647	4,990	171	538	2,294	8	117	0.42	0.01	0.09
3.3 Ashtabula River	146	486	121	242	100	14	32	0.21	0.02	0.07
3.4 Conneaut Creek	240	302	130	208	58	13	30	0.26	0.01	0.05
1.5 Cattaraugus Creek	698	855	187	361	52	7	19	0.49	0.01	0.12

1 Flows are the average for the period of record at the U. S. Department of the Interior, Geological Survey Stream Gaging station nearest the sampling location.

2 Arithmetic average.

TABLE 4

SUMMARY OF TRIBUTARY LOADINGS AT SAMPLING LOCATIONS BASED
ON WEIGHTED AVERAGES
1967

Sampling Location	Total Solids		Chlorides		Total Phosphorus	
	#/Day	Tons/Year	#/Day	Tons/Year	#/Day	Tons/Year
14.9 Maumee River	12,072,672	2,203,505	474,336	86,505	10,713	1,971
12.8 Portage River	794,275	144,905	48,298	8,797	868	158
13.6 Sandusky River	3,094,848	564,655	108,864	19,856	2,920	533
12.3 Huron River	779,328	142,241	26,525	4,855	554	101
6.2 Vermilion River	616,624	112,420	29,808	5,438	354	65
8.6 Black River	819,072	149,650	65,232	11,899	1,037	189
2.9 Rocky River	933,120	170,455	70,243	12,775	847	155
6.6 Cuyahoga River	3,798,144	693,135	469,152	85,775	8,640	1,570
3.7 Chagrin River	1,624,320	296,380	61,340	11,206	811	148
5.8 Grand River	1,442,016	263,165	182,304	33,280	373	68
3.3 Ashtabula River	209,088	38,143	19,267	3,504	74	14
3.4 Conneaut Creek	253,152	46,209	34,214	6,242	60	11
1.5 Cattaraugus Creek	1,845,504	396,895	44,928	8,213	552	101
Total	28,282,163	5,161,758	1,634,511	298,345	27,803	5,084

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TABLE 5

MAJOR SOURCES OF LOAD CONSTITUENTS BELOW SAMPLING LOCATIONS

Source	Flow mgd	Raw BOD #/Day	P.E.	Total Solids[1] #/Day	Total Solids[1] Tons/Year	Total Chlorides[2] #/Day	Total Chlorides[2] Tons/Year	Tot. Phosphorus[3] #/Day	Tot. Phosphorus[3] Tons/Year
Maumee River									
Perrysburg, O.	1.02	950	5,689	2,560	467	852	156	55	10
Walbridge, O.	0.05	x	x	125	23	42	8	x	x
Swanton, O.	0.35	600	3,593	219	40	292	53	37	6
Whitehouse, O.	0.10	x	x	63	12	84	15	x	x
Toledo, O.	68.67	96,330	576,826	43,000	7,850	57,100	10,400	5,531	1,009
Interlake Steel	44.0			x	x	x	x	x	x
Toledo Edison	x			x	x	x	x	x	x
Libbey-Owens-Ford	0.25			x	x	x	x	x	x
Allied Chemical	x			x	x	x	x	x	x
Sub-total				45,967	8,382	58,370	10,632	5,623	1,025
Tributary Sampling Locations				12,072,672	2,203,505	474,336	86,505	10,713	1,971
Total				12,118,639	2,211,887	532,706	97,137	16,336	2,996
Portage River									
Oak Harbor, O.	0.65	930	5,569	1,630	297	541	99	53	10
Gibsonburg Canning	x			x	x	x	x	x	x
Brush Beryillium	x			x	x	x	x	x	x
Sub-total				1,630	297	541	99	53	10
Tributary Sampling Locations				794,275	144,905	48,298	8,797	868	158
Total				795,905	145,202	48,839	8,896	921	168

TABLE 5 (Continued)

MAJOR SOURCES OF LOAD CONSTITUENTS BELOW SAMPLING LOCATIONS

Source	Flow mgd	Raw BOD #/Day	P.E.	Total Solids[1] #/Day	Total Solids[1] Tons/Year	Total Chlorides[2] #/Day	Total Chlorides[2] Tons/Year	Tot. Phosphorus[3] #/Day	Tot. Phosphorus[3] Tons/Year
Sandusky River									
Fremont, O.	3.09	5,580	33,413	1,940	354	2,570	468	321	58
Green Springs, O.	x	x	x	x	x	x	x	x	x
H. J. Heinz	x	25		900	164	x	x	x	x
Northern Ohio Sugar	x	870		x	x	x	x	x	x
Sub-total				2,840	518	2,570	468	321	58
Tributary Sampling Locations				3,094,848	564,655	108,864	19,856	2,920	533
Total				3,097,688	565,173	111,434	20,324	3.241	591
Huron River									
Huron, O.	0.78	1,150	6,886	1,960	338	650	118	66	12
Milan, O.	x	x	x	x	x	x	x	x	x
Norwalk, O.	2.25	4,310	25,808	1,141	197	1,880	324	248	45
Clevite-Harris Div.	x			x	x	x	x	x	x
Stokely-Van Camp	x			x	x	x	x	x	x
Sub-total				3,101	535	2,530	442	314	57
Tributary Sampling Locations				779,328	142,241	26,525	4,855	554	101
Total				782,429	142,776	29,055	5,297	868	158
Vermilion River									
Vermilion, O.	0.35	510	3,054	878	160	292	53	29	5
Sub-total				878	160	292	53	29	5
Tributary Sampling Locations				616,624	112,420	29,808	5,438	354	65
Total				617,502	112,580	30,100	5,491	383	70

TABLE 5 (Continued)

MAJOR SOURCES OF LOAD CONSTITUENTS BELOW SAMPLING LOCATIONS

Source	Flow mgd	Raw BOD #/Day	P.E.	Total Solids[1] #/Day	Total Solids[1] Tons/Year	Total Chlorides[2] #/Day	Total Chlorides[2] Tons/Year	Tot. Phosphorus[3] #/Day	Tot. Phosphorus[3] Tons/Year
Black River									
No. Ridgeville, O.	0.09	130	779	56	10	8	1	7	1
Elyria, O.	x	x	x	x	x	x	x	x	x
U. S. Steel - Tub. Operations	170.0			91,000(S)	16,607	0	0	x	x
Sub-total				91,056	16,617	8	1	7	1
Tributary Sampling Locations				819,072	149,650	65,232	11,899	1,037	189
Total				910,128	166,267	65,240	11,900	1,044	190
Rocky River									
Lakewood, O.	14.14	12,280	73,533	8,850	1,640	11,750	2,140	724	132
Sub-total				8,850	1,640	11,750	2,140	724	132
Tributary Sampling Locations				933,120	170,455	70,243	12,775	847	155
Total				941,970	172,095	81,993	14,915	1,571	287
Cuyahoga River									
Republic Steel	290.0			180,000(S)	32,850(S)	32,000	5,840	x	x
Sherwin Williams	x			x	x	x	x	x	x
U. S. Steel	23.5			84,000	15,330	1,000	183	x	x
E. I. DuPont	1.4			16,900	3,084	3,900	710	x	x
Jones & Laughlin	130.0			10,400(S)	1,898(S)	4,900	894	x	x
Elco Lube	x			x	x	x	x	x	x
Harshaw Chemical	1.4			x	x	3,100	566	x	x
Research Refining	x			x	x	x	x	x	x
Bailey Wallpaper	x			x	x	x	x	x	x
Cuyahoga Meat	x			x	x	x	x	x	x

TABLE 5 (Continued)

MAJOR SOURCES OF LOAD CONSTITUENTS BELOW SAMPLING LOCATIONS

Source	Flow mgd	Raw BOD #/Day	P.E.	Total Solids[1] #/Day	Total Solids[1] Tons/Year	Total Chlorides[2] #/Day	Total Chlorides[2] Tons/Year	Tot. Phosphorus[3] #/Day	Tot. Phosphorus[3] Tons/Year
Cuyahoga River (Cont'd)									
E. W. Ferry Screw	x			x	x	x	x	x	x
Ford Motor - Engine Plant	0.9			62(S)	11(S)	x	x	x	x
Burdett Oxygen	x			x	x	x	x	x	x
Sub-total				291,362	53,173	44,900	8,193	--	--
Tributary Sampling Locations				3,798,144	693,135	469,152	85,775	8,640	1,570
Total				4,089,506	746,308	514,052	93,968	8,640	1,570
Chagrin River									
None									
Grand River									
Fairport, O.	0.3	517	3,096	750	137	250	46	30	5
Painesville, O.	2.51	4,250	25,449	1,570	287	2,090	382	244	45
Calhio Chemical	0.20			36,000	6,570	11,000	20,075	x	x
A. E. Staley	x			x	x	x	x	x	x
Diamond Shamrock	5.3			6,500,000	1,186,250	3,900,000	711,750	x	x
Sub-total				6,538,320	1,193,244	3,913,340	732,253	274	50
Tributary Sampling Locations				1,442,016	263,165	182,304	33,280	373	68
Total				7,980,336	1,456,409	4,095,644	765,533	647	118
Ashtabula River									
Cabot Titania - Titania Dioxide Plant	3.0			1,930(S)	352(S)	5,880	1,073	x	x

TABLE 5 (Continued)

MAJOR SOURCES OF LOAD CONSTITUENTS BELOW SAMPLING LOCATIONS

Source	Flow mgd	Raw BOD #/Day	P.E.	Total Solids[1] #/Day	Total Solids[1] Tons/Year	Total Chlorides[2] #/Day	Total Chlorides[2] Tons/Year	Tot. Phosphorus[3] #/Day	Tot. Phosphorus[3] Tons/Year
Ashtabula River (Cont'd)									
Cabot Titania - Titania Tetra-Chloride Plant	3.0			11,000(S)	2,008(S)	15,000	2,738	x	x
Detrex Chemical Ind. Chlorinated Solvents Division	0.1			1,800	329	2,400	438	x	x
General Tire & Rubber - Chemical Division	0.1			680	124	250	46	x	x
Olin Mathieson Chemical - TDI	0.4			780(S)	143(S)	15,000	2,738	x	x
Diamond Shamrock Semi-Works	0.6			x	x	x	x	x	x
Reactive Metals - Metals Reduction Plant	1.3			430,000	78,475	270,000	49,275	x	x
Reactive Metals - Sodium & Chlorine Plant	0.4			8,800	1,606	x	x	x	x
Sub-total				454,990	83,037	308,530	56,308	--	--
Tributary Sampling Locations				209,088	38,143	19,267	3,504	74	14
Total				664,078	121,180	327,797	59,812	74	14

TABLE 5 (Concluded)

MAJOR SOURCES OF LOAD CONSTITUENTS BELOW SAMPLING LOCATIONS

Sources	Flow mgd	Raw BOD #/Day	P.E.	Total Solids[1] #/Day	Total Solids[1] Tons/Year	Total Chlorides[2] #/Day	Total Chlorides[2] Tons/Year	Tot. Phosphorus[3] #/Day	Tot. Phosphorus[3] Tons/Year
Conneaut Creek									
Conneaut, S.	0.24	2,360	14,132	600	101	200	37	136	25
Sub-total				600	101	200	37	136	25
Tributary Sampling Locations				253,152	46,209	34,214	6,242	60	11
Total				253,752	46,310	34,414	6,279	196	36
Cattaraugus Creek									
None									

[1] Total solids loadings from municipal sources were estimated using a total solids concentration of 500 mg/l and assuming 40 percent removal in primary treatment and 25 percent removal in secondary treatment.

[2] Total chloride loadings from municipal sources were estimated using a total chlorides concentration of 100 mg/l.

[3] Total phosphorus loadings from municipal sources were estimated using the population equivalent and 3.5 #/year/capita.

TABLE 6

SUMMARY OF TRIBUTARY LOADINGS TO LAKE ERIE
1967
(Sampling Location plus downstream data)

Tributary	Total Solids		Total Chlorides		Tot. Phosphorus	
	#/Day	Tons/Year	#/Day	Tons/Year	#/Day	Tons/Year
Maumee River	12,118,639	2,211,887	532,706	97,137	16,336	2,996
Portage River	795,90[illegible]	142,202	48,839	8,896	921	168
Sandusky River	3,097,688	565,173	111,434	20,324	3,241	591
Huron River	782,429	142,776	29,055	5,297	868	158
Vermilion River	617,502	112,580	30,100	5,491	383	70
Black River	910,128	166,267	65,240	11,900	1,044	190
Rocky River	941,970	172,095	81,993	14,915	1,571	287
Cuyahoga River	4,089,506	746,308	514,052	93,968	8,640	1,570
Chagrin River	1,624,320	296,380	61,340	11,206	811	148
Grand River	7,980,336	1,456,409	4,095,644	765,533	647	118
Ashtabula River	664,078	121,180	327,797	59,812	74	14
Conneaut Creek	253,752	46,310	34,414	6,279	196	36
Cattaraugus Creek	1,845,504	336,895	44,928	8,213	552	101
Total	35,721,657	6,516,462	5,977,542	1,108,971	35,284	6,447